CLAIMS

1. An apparatus for receiving and processing a modulated signal, the apparatus comprising:

an interface for interfacing with a host processor; and

an automatic gain control state machine coupled to the interface for receiving control information indicative of a modulation protocol, the automatic gain control state machine being selectably configurable for automatic gain control in accordance with any one of a plurality of modulation protocols.

2. The apparatus of claim 1 further comprising:

a storage location coupled to the interface for receiving and storing the control information and coupled to provide the control information to the automatic gain control state machine.

3. The apparatus of claim 1 further comprising:

at least one signal detector coupled to detect and provide an indication of a signal strength of the modulated signal to the automatic gain control state machine; wherein

the automatic gain control state machine is configured to operate in each of a plurality of selectable states, each state being selected depending on a detected signal strength of the modulated signal.

4. The apparatus of claim 3 further comprising:

an intermediate frequency generation circuit including at least one of a mixer and a filter;

wherein the at least one signal detector comprises:

an off-channel signal detector coupled to receive a radio frequency modulated signal on an input side of the intermediate frequency generation circuit to provide a digital indication of signal strength of the radio frequency modulated signal to the automatic gain control state machine; and

an on-channel signal detector coupled to receive an intermediate frequency modulated signal on an output side of the intermediate frequency generation circuit and coupled to provide a digital indication of signal strength of the intermediate frequency modulated signal to the automatic gain control state machine.

5. The apparatus of claim 4 further comprising:

a storage location coupled to the interface for receiving and storing the control information and coupled to provide the control information to the automatic gain control state machine; and

an attenuation circuit coupled to receive at least one attenuation control signal from the automatic gain control state machine, the automatic gain control state machine providing the at least one attenuation control signal depending on the control information stored in the storage location and the signal strengths of the modulated signals.

6. The apparatus of claim 5 wherein the attenuation circuit comprises a variable gain amplifier.

7. The apparatus of claim 6 wherein the attenuation circuit further comprises a step attenuator.

8. The apparatus of claim 5 further comprising an antenna coupled to provide the radio frequency signal to the attenuation circuit.

9. The apparatus of claim 4 further comprising:

a variable gain amplifier coupled to receive an input radio frequency signal and to provide an amplified radio frequency signal; and

a DAC coupled to receive a digital control signal from the automatic gain control state machine and to provide an analog control signal to the variable gain amplifier depending on the control information and the signal strengths of the modulated signals.

10. The apparatus of claim 5 wherein the interface is a serial peripheral interface, the apparatus further comprising the host processor, the host processor being coupled to the serial peripheral interface to provide the control information indicative of the modulation protocol to be used by the apparatus for communication with other apparatus using the modulation protocol.

11. The apparatus of claim 3 wherein each of the plurality of selectable states includes at least one of the group of characteristics consisting of: automatic gain control action, update rate, step size and an adapt initiation holdoff time.

12. The apparatus of claim 3 wherein each of the plurality of selectable states are defined by selectable signal strength threshold values.

13. The apparatus of claim 3 wherein a number of the plurality of selectable states is programmable via the interface.

14. An apparatus comprising:

a task specific AGC control circuit coupled to receive an indication of at least one signal characteristic and coupled to provide an AGC control signal for controlling gain of an AGC loop, wherein the AGC control circuit is configured to control the gain of the AGC loop in accordance with a plurality of states, each state corresponding to a selectable range of the at least one signal characteristic and to at least one programmable threshold defining at least one such range; and

at least one gain control stage coupled to the task specific AGC control circuit, the at least one gain control stage controlling gain of a signal depending on the AGC control signal.

15. The apparatus of claim 14 wherein the at least one programmable threshold is selected based upon which one of a plurality of modulation protocols is selected.

16. The apparatus of claim 14 wherein the at least one signal characteristic includes a peak-to-average signal swing indication and a signal strength indication of a received signal, the apparatus further comprising an AGC loop, the AGC loop comprising:

the at least one gain control stage comprising at least one of the group consisting of a step attenuator and a low noise amplifier;

the task specific AGC control circuit; and

a detector stage providing the signal strength indication, the indication being at least one of the group consisting of a dc voltage or a digital value proportional to the received signal.

17. A receiver comprising:

an interface for interfacing with a host processor;

a task specific processor for automatic gain control, the task specific processor being coupled to receive information from the host processor for determining automatic gain control parameters, the task specific processor being configured to operate independently of the host processor.

18. The receiver of claim 17 wherein information from the host processor includes at least one of the group consisting of signal range information, signal strength threshold information, automatic gain control update rate information, and automatic gain control step size information.

19. The receiver of claim 17 wherein the task specific processor is configured to operate according to a gain control function which is continuous within each of a plurality of signal strength ranges and which is nondifferential at each threshold at an edge of each range.

20. An automatic gain control method comprising:

initializing an automatic gain control state machine to a set of preset conditions;

detecting a signal characteristic of a signal to provide a detected signal characteristic;

controlling gain of the signal by a gain stage using the detected signal characteristic, wherein the gain is controlled over a plurality of ranges of the signal characteristic according to a gain control function which is continuous within each of the plurality of ranges and nondifferential at an edge of each of the plurality of ranges.

21. The automatic gain control method of claim 20 wherein the signal characteristic is signal strength, the method further comprising:

comparing the signal strength to a threshold value, the threshold value defining an end point of a range of signal strength;

controlling gain according to a first signal transfer function if the signal is less than the threshold value; and

controlling gain according to a second signal transfer function if the signal is greater than the threshold value.

22. The automatic gain control method of claim 21 further comprising:

determining if the threshold value is enabled prior to any comparing of the signal strength to the threshold value; wherein

the step of comparing the signal strength to the threshold value is performed only if the threshold value is enabled.

23. The automatic gain control method of claim 20 wherein the signal characteristic is signal strength, the method further comprising:

comparing the signal strength to a threshold value, the threshold value defining an end point of a range of signal strength;

selecting a first attenuation step size if the signal is less than the threshold value; and

selecting a second attenuation step size if the signal is greater than the threshold value.

24. The automatic gain control method of claim 23 further comprising controlling gain using at least one of the first attenuation step size and the second attenuation step size.

25. The automatic gain control method of claim 23 wherein the signal strength is to be controlled towards a programmable target operating range and away from a plurality of operating ranges outside the target operating range, and an attenuation step size for an operating range outside the target operating range depends at least in part on the magnitude of the difference of a threshold of the operating range outside the target operating range and a threshold of the target operating range.

26. The automatic gain control method of claim 23 further comprising:

determining an indication of time that the automatic gain control state machine has been in a particular state;

selecting an adapt step size if the time exceeds an adapt holdoff value.

27. The automatic gain control method of claim 23 wherein the indication of time is a count of a number of cycles or iterations that the automatic gain control state machine has been in the particular state.

28. The automatic gain control method of claim 23 further comprising:

selecting a first update rate if the signal is less than the threshold value; and

selecting a second update rate if the signal is greater than the threshold value.

29. The automatic gain control method of claim 27 further comprising controlling gain using one of the first attenuation step size or the second attenuation step size and one of the first update rate or the second update rate.

30. The automatic gain control method of claim 20 wherein the signal characteristic is signal strength, the method further comprising:

comparing the signal strength to a threshold value, the threshold value defining an end point of a range of signal strength;

selecting a first update rate if the signal is less than the threshold value; and

selecting a second update rate if the signal is greater than the threshold value.

31. The automatic gain control method of claim 30 further comprising controlling gain using one of the first update rate or the second update rate.

32. The automatic gain control method of claim 30 further comprising:

determining an indication of time that the automatic gain control state machine has been in a particular state; and

selecting an adapt update rate if the time exceeds an adapt holdoff value.

33. The automatic gain control method of claim 20 further comprising:

determining if bidirectional gain tracking is enabled;

controlling the gain bidirectionally if tracking is enabled; and

controlling the gain unidirectionally if tracking is not enabled.

34. The automatic gain control method of claim 20 further comprising:

determining if bidirectional gain tracking is enabled;

increasing attenuation of the signal strength if bidirectional tracking is not enabled; and

increasing and decreasing attenuation of signal strength if bidirectional tracking is enabled.

35. The automatic gain control method of claim 20 wherein initializing the automatic gain control state machine comprises:

loading state parameters from a storage location to the automatic gain control state machine;

setting a digital-to-analog converter to an output value reflective of the state parameters by the automatic gain control state machine;

controlling gain of the signal by the gain stage under control of the digital-to-analog converter without influence by signal characteristics of the signal being gain controlled; and

releasing the automatic gain control state machine from the set of preset conditions to close an automatic gain control loop.

36. The automatic gain control method of claim 35 wherein the state parameters comprise at least one from the group consisting of: range edge threshold values, gain action information, step size information, update rate information, and adapt period information.

37. In a receiver having an AGC controller, the receiver adapted to interface with a host processor via an interface, a method comprising:

controlling an AGC loop within the receiver using an AGC state machine implemented within the receiver to affect at least one of attenuation and gain of a signal in a first way if signal strength of the signal is in a first programmable range; and

controlling the AGC loop using the AGC state machine to affect at least one of attenuation and gain of the signal in a second way if the signal strength is in a second programmable range.